found in Bactria Proper, stronger grounds are elicited for believing that he did succeed Euthydemus in his hereditary possession of the integral kingdom. The rare occurrence of the Mayus or of the Demetrius coins, seems to suggest that he was very shortly after his succession ejected by Eucratides. Mr. Schlegal, who assumes that he did not succeed his father in Bactria, but who acknowledges his ejection from his paternal dominions, and his retirement into Arachosia, must allow that to be ejected, he must have once possessed.

As governor during his father's life time, of provinces along the Indus, the elephant's head would be an appropriate type for the coin struck by Demetrius. The bell, which appears to have attracted so much attention in Paris, is in shape and proportion similar to the large bells now in common use with native chieftains in Upper India, saving with a rope on either side the elephant, instead of about his neck, as in the coin. The object of the modern custom is to regulate the pace of the animal by the alternate sound of the swinging bell; the ancient practice originated, perhaps, in some similar fancy.

Should any of our contributors see reason to think that these observations have really made out the point they are intended to establish, may I hope that the idea of further success in elucidating fact as regards a very interesting, but most obscure epoch, will encourage them to make public the fruits of their research? I have requested Captain Hay to favour me with drawings of the most remarkable coins in his collection, and am most sorry to say that I have been as yet unable to have lithographs taken from the impressions in sealing wax which he has sent me. H

Memorandum on the differences of the Meridian of the Observatory at Madras and the Flag-Staff of Fort William and of the Cantonment of Futtehghur in the Doab.—By Colonel J. A. Hodgson, *late Surveyor-General of India.*

I purpose in the following remarks, to give an account of the above differences, as deduced from eclipses of the first satellite of Jupiter, made by myself, and to add some notices regarding the modes of determining the longitudes, and latitudes, of places in Asia, which may be found useful to the officers of this army, now serving in places far distant from each other.

The Indian Government has for upwards of fifty years maintained an Observatory at Madras, but until 1829, it was on a small scale, with an astronomer and a few native assistants; since that time, the establishment has been improved, and valuable instruments erected, of which most important use has been made by Mr. Taylor, the present astronomer to the Honorable East India Company.

In Bengal, we have not had any regular astronomical establishment, but many valuable observations have at different times been taken by the officers of the Bengal Army, employed on geographical and other duties, as well as by gentlemen of the civil service, in different parts of the country, for their own satisfaction.

With regard to the longitude of the Madras Observatory, it was very assiduously investigated for many years, by the late astronomer Mr. Goldingham, as may be seen by the Madras Observatory papers, and others published by him, and in his Memoir laid before the Royal Society, in which he has recorded the observations made of the eclipses of the satellites of Jupiter. Until the year 1817, the meridian of the Observatory was accounted to be 5h. 21m. 14s. East; but afterwards Mr. Goldingham had reason, by correcting his numerous and valuable observations, by the errors of the tables, and from some emersions and immersions of the 1st and 2nd satellites correspondent with observations made at Greenwich, to estimate his Observatory to be 5h. 21m. 9s.·4.

In the 1st. volume of the Madras Observatory Papers, Mr Taylor gives for his meridian,

	h.	m.	s.
By Jupiter's first satellite	5	21	1·00
By transits of moon and stars....			3·77
Mean.	5	21	2·38

but in the 2nd. volume (page 113) the astronomer, from more numerous transits, *compared* with those made at the Cambridge Observatory, finds.—By 14 transits of

	h.	m.	s.
first limb, and stars, ...	5	20	30·56
2nd ditto, 2nd. ditto,			33·60
These *reduced* to Greenwich, give for Madras Observatory, ...	5	20	55·62

which Mr. Taylor thinks may be 8 or 10 seconds in defect. Mr. Taylor, who has now, I believe, gone to England, will no doubt find there, numerous observations with which he can *compare* the above, and the subsequent observations he has made, and will be able to put to the test, the value of the lunar transits, when he has the comparisons from the 1st. and 2nd limbs of the moon in *equal and greater numbers;* he will also get correspondents for his numerous sights of Jupiter's satellites: we shall *then see,* how far the two modes, by the transits and by the satellites, agree with each other. It is an inquiry of interest, but in the interval, I think we may fairly take the mean of what I have above stated, thus—

	h.	m.	s.
Mr. Goldingham's 1st. and 2nd satellites,	5	21	9·40
Mr. Taylor's 1st. satellite and lunar transits			3·77
Ditto, 2nd. satellite of ditto, ditto,	5	20	55·62
Mean Madras Obsy.	5	21	02·93

The following series of nine immersions, and eight emersions of the first satellite is selected from my notes, as having been made under the circumstances most favourable to accuracy. Those circumstances are, that the immersions and emersions be *equal in number;* these are nearly so—it is proper that they should be taken with *telescopes of the same description,* at either place; these were *so* taken, the telescopes being those of Dollond, of 45 inches focal length, aperture 2 inches ·7 and power 70 to 75;—that the *same* person observe at each place; I myself did so at the Surveyor-General's House at Chowringhee, Calcutta; and the *same* individual, I believed, took the eclipses at the Madras Observatory—the satellite was the *first,* which by reason of its quicker motion, gives the best results. The circumstances of climate, and altitude of the planet, did not very materially differ at Calcutta and Madras. When these conditions are attended to, a moderate number of corresponding sights will give a better difference than a far greater number would under other circumstances. I have the dates and particulars of all these eclipses, but it would take too much space to insert them here; they were taken in 1821, 1826, 1827. The differences in time, reduced to the Flag-Staff, are—

Emersions.		*Immersions.*	
m.	s.	m.	s.
32	23·70	31	57·90
32	38·30	31	52·70
32	27·00	31	28·00
32	08·00	32	08·29
32	12·70	32	09·51
32	27·10	31	56·09
32	51·50	32	11·76
32	26·10	32	08·91
32	17·70		

	h.	m.	s.
Mean of 9 emersions, ...		32	25·79
Ditto of 8 immersions, ...		31	59·08
Mean of emersions and immersions of the 1st. satellite, ...		32	12·4
The mean before stated for the Madras Observatory, ...	5	21	2·9
	5	53	15·3
Longitude of Flag-Staff, Fort William,	88°	18′	45″

I must mention, that I should have taken a greater number of eclipses of the satellites in Calcutta, had I not been absent from it on duty, in the North-west provinces, from 1822 to the rains of 1826. To several of my observations of eclipses in 1821, I found correspondents, in the series taken by the late Colonel Beaufoy, at Bushey Heath; they give for the Flag-Staff 5h. 53m. 10s.3. I sent to the excellent astronomer at the Cape of Good Hope, the late Rev. Fearon Fallows, the particulars of my observations, requesting him to give me correspondents, if he had any. I may here most conveniently make an extract from his reply (dated 1st September, 1823) to my letter. He says, "Amongst the very few eclipses which "had been taken, I could not find any corresponding to the date "of your observations, which I am happy to say bear the stamp "of being taken with great accuracy. As the calculations of "these eclipses are not made from the most approved tables, "(De Lambre's,) and as you may be desirous of seeing your result

" compared with those tables, I shall take the liberty of selecting " those which appear to me to have been taken by the same " person, and with the same telescope. The longitude of the " Surveyor-General's Office at Calcutta, from comparison of obser- " vations, made of Jupiter's 1st satellite, with De Lambre's tables.

Date.		Emersions.			Date.		Immersions.		
		h.	m.	s.			h.	m.	s.
1821	Nov. 22	5	53	1·6	1822	Oct. 10	5	53	6·4
——	Dec. 8			12·3	——	Oct. 24	5	52	55·4
1822	Jan. 7			8·5	——	—— 26	5	53	12·0
——	—— 16			5·7	——	—— 31			6·5
——	Nov. 27			10·2		Nov. 18			1·0
——	Dec. 13	5	52	56·1					
							5	53	4·26
——		5	53	5·73					
——		5	53	4·26					
	Mean	5	53	5·00					

" The mean is about twelve seconds of time less than you " make it by the Nautical Almanac, yet the accordance between " the means of the emersions and immersions, is truly sur- " prising." These observations, with particulars of the transit of Mercury, Mr. Fallows sent to the Admiralty. Though the result deduced by him is *not* from corresponding sights, yet the corrections made by so skilful an astronomer, and his opinion of their value, may be thought to render them worthy of some notice. In 1821 and 1822 the Surveyor General's Office was at No. 8, Russell Street, Chowringhee. The reduction to the Fort Flag-Staff is four seconds of time, it will therefore, by these observations, be in 5h. 53m. 3s.1 = 88° 15′ 15″.

If the above eclipses were in sufficient number to entitle them to a place on the mean, it would give for the Madras Observatory, 5h. 20m. 59s·34.

Another mode by which I endeavoured to find the meridian of Fort William, was by the transits of the moon's limbs over the meridian, compared with those of stars differing little from her in right ascension and declination ; for this purpose, on my return to Calcutta in 1826, I instituted a series of these observations in the small temporary observatory on the roof of my house, No. 37, Park Street, Chowringhee. The transit telescope, of thirty-four inches focus, had five wires, though not large, was good, and firmly mounted, and the clock and other astronomical apparatus, were of the best kind. The transits were taken by the native assistant, the Syud, Mhir Mhosin, a most respectable man and steady observer ; the calculations were made in my office, immediately after the transits were taken, by the computer, Mr. Vincent Rees, aided by the young men, apprentices, in the Survey Department.

The whole of these calculations in detail, were inserted in lithographic forms, and were forwarded by the Government to the Royal Astronomical Society of London. They are contained in two large folio volumes. I need here only mention the results.

From 19*th Nov.* 1826, *to* 13*th Dec.* 1827.

	h.	m.	s.
82 transits of stars and moon's preceding limb	5	53	29·43
82 transits do. do. following limb ..	5	53	12·89
Mean reduced to Flag-Staff	5	53	21·16

These results, it is to be remarked, are deduced from the data in the *Nautical Almanac,* and *not* from *comparisons* with observations made at Greenwich, from which a better determination would be obtained, if so great a number of transits had been taken at Greenwich or Cambridge ; but that is not likely to have been done in so short a space of time, in the cloudy climate of England ; because, results from those transits, though very numerous, are only merely from *calculation* from the Nautical Almanac. I have thought it better, *not* to allow them a place in the general mean ; though I did so in some observations I gave to the Marine Surveyor General, Captain Ross, and which, with observations he had taken, gave for the Flag-Staff 5h. 53m. 20s·7. as he has mentioned, in the notice published by him in 1829. It seems, I think, likely, from the tendency of Mr. Taylor's subsequent operations at Madras, that the meridian of Fort William Flag-Staff will prove to be less than the above.

This method of determining longitudes, or rather *differences* of longitude, has been much recommended of late by astronomers; and doubtless it is as capable of great accuracy, when a long series of corresponding sights can be taken in fixed observatories; but to those to whose lot it falls, for the most part, to determine new positions,—to military and maritime officers, and to scientific travellers,—it will not I fear be found so generally convenient, as it may appear to be. It is requisite, that the transit instrument be good, and well and firmly fixed, and that the sights be most carefully made, for an error of only two-tenths of a second of time, on the observation of the transit of the moon's limb, will on her mean motion cause an error of six seconds of time in the longitude. To duly estimate a small part of time requires much practice, and it is difficult to be sure of the precise instant when the moon's *preceding limb* touches the wires, it is *perhaps* rather less so of the *following* limb leaving the wire, but a mean must be taken; add to this, that except to those, whose sole occupation is in a fixed observatory, it would be very irksome to get through a long series of lunar transits, at the varying periods of three quarters of an hour's difference of time, every night. On these accounts, I hope the satellites of Jupiter (especially the first) will meet with more favour than has been allowed to them lately, in some notices on practical astronomy. I believe that by their means, the meridian of *more* distant places have been nearly settled, and more useful additions, in that particular, made to Geography, than by any other mode; and from long experience, I find that great dependence is to be placed on the results, *provided* the requisite conditions, which I have mentioned, are attended to. In this extensive country, we little need insist on the important consequences of well determined differences of longitude. Moderate distances, can be best laid down from *survey*, and referred to some known meridian; but it frequently happens in the emergency of service, that officers even on a survey, are detached to a great distance from their field of operations, with which their new positions cannot be connected, *except* by astronomical means. This was particularly the case, when the revenue surveyors in the North-western provinces were suddenly ordered to join the armies on the eastern frontiers, in the Burmese war. I was at that time the Revenue Surveyor-General. With those officers, though they were withdrawn from my superintendence, I continued to keep private correspondence, and I particularly requested them to make as many observations of the satellites as they could, that I might compare them with those I made at Futtehghur; and to the skill and zeal of Majors Bedford and Wilcox, in Assam, to Major Pemberton, in Munnipour, of Major Fisher, in Sylhet, Capt. Wroughton in Arracan, and the late Capt. Grant, at Prome, (all officers of the Bengal Native Infantry Regiments,) I am indebted for many data, by which the geography of the eastern frontiers has been so much improved. It may serve to give an idea of the extended field of their operations, merely to mention that the observed difference of longitude taken by me at Futtehghur, and Major Wilcox at Suddia in Assam, by the 1st satellite, was in time, 1h. 4m. 15s., or 964 miles of longitude.

When places like Suddia, Munnipour, and others at such great distances, and to which there had been no opportunity of extending geodesic surveys, can have their positions assigned to them exactly in latitude, and within perhaps two to three miles, or indeed I think within less, by a few correspondent observations of the satellites, they serve as starting points, from which to originate more detailed and local surveys, in those new countries. As an example,

I will now give the differences of meridian of Futtehghur and Madras Observatory. My house at Futtehghur was on the high right bank of the Ganges, and nearly in the rear of the left of the Native Infantry lines, and in latitude 27° 21′ 37″.

	Date.	Set.	Im. or Em.	Madras time.	Futtehghur time.	Difference.
				h. m. s.	h. m. s.	m. s.
1824	Dec. 21	1	Immersion	11 36 41 ·7	11 33 56 ·3	2 44 ·8
—	— 9	—	Do.	13 29 57 ·8	13 27 03 ·8	2 54 ·9
1825	—	—	Do.	17 16 46 ·7	17 13 32 ·3	3 13 ·4
1825	Jan. 10	1	Do.	10 00 35 ·6	9 57 17 ·3	3 18 ·2
—	— 26	1	Do.	8 15 28 ·6	8 13 13 ·0	2 15 ·6
				5 Immersions	Mean	2 53 ·3
				h. m. s.	h. m. s.	
1825	Mar. 22	1	Emersion.	7 17 05 ·7	7 14 42 ·0	2 23 ·7
—	—	1	Do.	9 11 32 ·5	9 09 20 ·0	2 12 ·5
—	April 5	1	Do.	11 06 23 ·0	11 04 19 ·0	2 04 ·0
—	— 21	1	Do.	9 25 07 ·4	9 22 59 ·0	2 08 ·4
—	— 28	1	Do.	11 20 15 ·6	11 18 03 ·0	2 12 ·6
				5 Emersions.	Mean.	2 12 ·2

Mean of Immersions and Emersions.		2	32	·7
Madras Observatory.	5	21	2	·9
Futtehghur.	5	18	30	·2

The above were all taken with Troughton's 46-inch telescope, power 64, and *by myself,* except one immersion on the 9th December, which was observed by Mr. William Rix James, one of my best sub-assistants. At the same time observations were taken by several young men, apprentices in the Revenue Survey Department, in my presence ; but I did not allow of any communication between them,—each gave to me, on the spot, separately and silently, the time at which he noted the phenomenon.

The following are the differences given by numerous immersions and emersions of 1st satellite.

		h.	m.	s.	
Dollond's 64-inch telescope, power	100 ..		2	28	·7
Troughton's 46 Do. Do. power	64 ..		2	29	·2
Dollond's 45 Do. Do. ..	75 ..		2	32	·4
Mean, ..			2	30	·1
Madras Observatory, ..		5	21	2	·9
Futtehghur, Do.		5	18	32	·8

These were the best telescopes, and used by the steadiest observers, but not always the same instrument, by the *same* person. The mean of these, with that of *my* individual sights, give 2m. 31s. ·40 for the difference, which must be near the truth, and for my station 5h. 18m. 32s. ·37, or 79° 38′, that is, if the meridian of Madras be correctly settled.

I may further mention, that I took and compared with the Nautical Almanac six immersions, and an *equal* number of emersions of the 1st satellite—they give,

	h. m. s.
6 immersions,..	5 18 32 ·7
6 emersions, ...	5 18 38 ·3
Mean, ..	5 18 35 ·5

All taken with Troughton's 46-inch telescope, power 64, and by the *same* person.

I have extended these remarks to a far greater length than I intended, but perhaps some notice of another mode of investigating the longitude, may be useful to the officers of the Bengal army, who are serving with our regiments from Afghanistan to China. This is the well known mode of lunar distances from the sun and stars, which has not been so much used on land, as it might be, and with very great advantage, in the clear atmosphere of Asia; frequent opportunities of seeing the moon and stars and sun occur; the mode of operating is not difficult, and the instruments required are easy of carriage, and do not require any fixed supports. The calculation is rendered simple, and the results satisfactory, by means of the correct data in the Nautical Almanac; with these, and that most excellent of all instruments, *Troughton's reflecting circle,* any officer may, with a little practice, do good service to geography. I wish it to be understood, that it is not by the *sextant* that we are to look for such results, it being only a second best instrument, but from the *circle,* which is, though a little heavier, equally, nay, *more convenient,* in use, than that imperfect part of a circle, the sextant; which should never be used on land, nor at sea either, if satisfactory longitudes are hoped for; and where are they more required?

As Troughton's directions for using his circle are not universally known, I will here extract from them a few lines, in which he plainly states its advantages, when compared with the sextant; they are chiefly these:—

"The observations for finding the index error, are rendered useless; all knowledge of that, being put out of the question, by observations both forwards and backwards. By the same means the errors of the *dark* glasses are also corrected, for if they increase the angle one way, they must diminish it the other, by the same quantity. This also perfectly corrects the error of the horizon glass, and those of the index glass, very nearly. But what is of still more importance, the error *of the centre* is perfectly connected, by reading the three branches of the index, while this property, combined with that of observing both ways, probably reduces the errors of dividing, to *one-sixth part* of their simple value. Moreover, angles can be measured as far as one hundred and fifty degrees, consequently the sun's double altitude may be observed, when his distance from the zenith is not less than fifteen degrees, at which altitude the head of the observer begins to intercept the rays of light, incident on the artificial horizon, and of course if a greater angle could be measured, it would be of no use in this respect."

Mr. Troughton has not noticed a farther great advantage, in there being no need to take the index error of the circle, as there is with the sextant; the finding this error with the *latter,* as it is generally done by measuring the sun's diameter, on each side of the zero, is well known in these hot countries to be a most painful, as well as a tedious and uncertain operation, and we measure only on a small part of the arc the glaring disk of the sun, through the stained glasses, which we see under a very different degree of brightness, from that under which we take the contact of the moon and sun or stars, and this index error *ought,* with the very best sextant, to be rigorously examined at *each* observation.

With the circle the correction for the zero point is included in the *observed* distances on both arcs, and given on six parts of the circumference; and what is of great consequence, the observed objects have the same, or very nearly the same, degree of light, so that the eye has not to change its focus and condition; besides, if the reading of the three indexes take up more time, it is a very little more than the reading of one, it is amply repaid by the time gained, in not being obliged to take the index error.

In Mr. Troughton's paper, he, in his usual clear manner, explained the adjustments and mode of using his circle. I give one more extract from it, to shew the opinion of him, allowed to be the best artist in Europe, of its value; he says—

"The greatest error, to which dividing by a good engine "is liable, may be taken at about twenty seconds; the six "readings required in a double observation on different parts "of the circumference, will probably reduce that error to "within five seconds, where the reflecting glasses and teles-"copes are good, and power considerable (about twelve) a "mean of contacts will come out within this quantity, and "where every other source of error is corrected by the prin-"ciples of the instrument, we are of opinion, that a series of "*lunar observations* will give the longitude on land, nearly, "if not quite, as accurately, as can be obtained from an occul-"tation of a star, by the moon, when observed with a powerful "telescope."

It is well known that Mr. Troughton made more and better sextants than any other artist, and of course derived much profit by their sale, yet such was his disinterested desire that his circle should come into general use, that he made the price only one guinea more than that of his best sextants, though the real difference of cost in material and workmanship is considerable. On the same terms, and with the same excellence of execution, Troughton's reflecting circles are now supplied and constructed by his worthy successor, Mr. William Simms, F.R.S., an artist whom Mr. Troughton selected as best worthy to sustain his great reputation.

The chief reason why the circle has not come into more general use *at sea*, is its greater weight than the sextant, and the partiality men feel for instruments they have been used to;

but the difference of weight is not much, and after being accustomed to it, it feels steadier in the hand than the sextant. It may indeed happen when a ship has much motion, that in *one* position of the circle, the right hand being further from the eye than it is with a sextant, a degree of inconvenience is felt, but it is soon surmounted, and is moreover balanced by the convenience of having two handles to the circle, so that the face is never held downwards, as the sextant must frequently be.

There is indeed a little longer time required to read off the three verniers than the single one of the sextant, and this may sometimes make the assisting observers of the sun and moon's altitude impatient, or less attentive. For my part, I think that lunar observations are most satisfactorily taken *without an assistant,* except one to note the watch, (and one may be dispensed with) all that is required, is to have, say, a sextant and a good quadrant. Then proceed to take one altitude of the moon, and lay the sextant down ;—that done, take one of the sun, with the *quadrant,* and lay it down ;—then take two or three sets of distances with the circle on both arcs, and then observe the altitudes of sun and moon, noting all the times.

All these things, with a little pre-arrangement, may be soon and *calmly* done, which is the chief thing, and readily reduced to the mean of times and distances; but if two instruments are not available, the altitudes may be taken with the circle. On shore the altitudes of sun or star and moon may be taken with a well adjusted theodolite, or sextant, or the circle, and if the observer has not an assistant, the seconds of time may be conveniently noted by the beat of a metronome, but a practised observer will himself count the seconds correctly. Or if the latitude and time are correctly known, as they can be *on land,* altitudes of the sun, moon, or stars, may be calculated. In investigating longitudes on *shore,* the time should always be determined by equal altitudes of the sun or stars, which may be taken by two or three sextants with the artificial horizon, or by meridian passages of stars made with a portable transit telescope. Lithographic forms are useful, in which to fill up all the figures of calculations, and these should always be preserved.

In determining *latitudes,* the reflecting circle is most useful to the geographical surveyor and navigator. By no instrument can so many good observations be taken in so short a time, the meridian altitudes of the sun and stars, one day or night, taken by the readings of the three branches of one arc are corrected by those of the next; but by a still more rapid, and equally accurate process in one day, a sufficient number of circummeridional altitudes of the sun can be taken, and reduced to the *meridian.* During ten minutes on each side of noon, ten or twelve double altitudes may be well taken from the artificial horizon, marking the horary angles by the chronometer, and at night, many stars may in like manner be calmly and well observed. They are best selected on both sides of the zenith, and the time from noon may be extended in proportion to the slowness of the star's motion; with the *pole star* to a great extent at sea, but on land, in geodesic operations, it may be extended to half an hour on each side of the meridian. Of course, as in a lunar distance, the observations must be taken on the right and left arcs alternately, or on equal numbers before and after the meridian passage. A stand is sometimes used with the circle, but I always found I could work quicker and better without. In oblique distances a support for the elbow is desirable, but in taking altitudes, the best way is to sit on the ground, the back being supported by a Hindostanee morah, or some such thing; *this* posture gives to the hands perfect command over the instrument; also remember that when the glass roof is used over the mercury it should be reversed at each contact. Circumstances *may* prevent observations with the circle being obtained on both the arcs, in such cases the instrument may be used in the manner of a sextant, and the index error applied, with this *advantage* over the sextant, that the index error, as well as the observed angle which it is to correct, is read on three verniers instead of on one, as with the sextant; also the index error may be taken on two small stars, or other well defined objects, subtending a greater angle than the sun's diameter, and the usual painful operation of measuring it avoided altogether. With the circle also, which is called at sea the back observation, for the altitude of the sun or a star may be taken.

To conclude, I can from long experience of its excellent properties, very confidently recommend to my brother officers of the Indian Army, the use of Troughton's reflecting circle, and also of a small theodolite, which I will describe, as it was lately constructed under the following circumstances. When I was in England, my opinion was demanded at the East India House as to the best construction of theodolites required for the revenue surveys, in the North-west provinces. I well knew the defects of the instruments hitherto supplied to the government, which were unsteady and top-heavy. I accordingly consulted Mr. Simms, and we agreed on the construction of the instrument, I will now describe.

This theodolite, though small, being only five inches in diameter, is of a stout firm make, the azimuthal circle has three verniers, and by it horizontal angles can be taken with much exactness, by taking them on both arcs, in the same manner as in the reflecting circle, each angle being from the result of six readings. When more exactness is required, several observations should of course be taken, and as a further check, the angles may be repeated on different parts of the limb, due attention being always paid to the lower, or watching telescope. The vertical angles are taken on a complete circle, which being capable of reversion has many advantages as to correct observations and means of adjustment. Altitudes and depressions are to be taken with the face of the vertical circle in one direction, it is then to be reversed in azimuth, and the operation repeated, there being room for the telescope to be turned over, as is done with astronomical circular instruments, and the vertical angles repeated. There are two levels as usual, but the correction of the line of collimation is best effected by taking the direct altitude of a stationary object, and its reflected image by depression on quicksilver. By this last mode of observing, also, a desirable degree of approximation to the latitude may be had when reflecting instruments are not at hand, or cannot be used.

A good sized magnetic compass is part of this theodolite, and can be applied above it, when required.

The instrument is mounted on a brass tripod, which may be commodiously placed on a wall, or other situation, when the usual wooden stand (which it also has) cannot be used.

This theodolite being so portable and strong, would be found most useful to the military surveyor or scientific traveller.

Mr. Simms speedily completed an extensive order for these instruments; they were sent to the India House, and I suppose to India.

Those officers who have the requisite opportunities and instruments, may also avail themselves of some other modes of determining differences of meridians.

These modes (which are noticed in the account of the survey of the Himalya Mountains, in the 14th vol. of the Asiatic Researches, page 189) consist in chronometrical observations, the sudden ignition of gunpowder at distant stations, and the observation of the horizontal angles subtended by any two or three of the well defined snowy peaks, the positions of which in latitude and longitude have been determined by the survey; these peaks, it is well known, are visible as well in the mountains as in the plains, at very great distances.

J. A. H.

Teetaghur, May, 1840.

Proceedings of the Asiatic Society.

Wednesday Evening, 1*st April,* 1840.

The Hon'ble H. T. Prinsep, Esq. Vice-President, in the chair.

The Proceedings of the last Meeting were read.

The Rev. Professor Street and Rajah Kishtonatha Raya, proposed at the last Meeting, were balloted for, and duly elected members of the Society.

Library.

Read a letter from T. H. Maddock, Esq., Secretary to the Government of India, forwarding for inspection the following works—

Illustrations of Indian Botany, No. 13.

Figures of Indian plants, No. 13 and 14. By Dr. Wight.

Read a letter from Col. J. Stuart, Secretary to the Government of India, Military Department, forwarding copy of a work containing the result of Astronomical observations at the Observatory of the Madras Presidency, during the years 1838 and 1839.

Literary and Antiquities.

Read a letter from H. Torrens, Esq. late Officiating Secretary to the Government of India, General Department, transmitting three books, being a Political and